HL 21: Focus Session: Highlights of Materials Science and Applied Physics II (joint session DS/HL)

Jointly organized on the occasion of the 60th anniversary of the *physica status solidi* journals (*pss*, http://www.pss-journals.com), this Focus Session features several invited presentations, talks and posters from key contributors on core condensed matter and applied physics topics. Highlights comprise the latest results on diamond, nitride semiconductors, organic materials, two-dimensional and quantum systems, oxides, magnetic materials, solar cells, thermoelectrics and more.

physica status solidi was launched by Akademie-Verlag Berlin in July 1961 and is published by Wiley-VCH Berlin and Weinheim today, supported by Wiley colleagues in China and the US. While in its first three decades it served as an East-West forum for solid state physics, since 1990 it has evolved into a family of journals with international author- and readership in a globalized scientific world. Its professional editorial services include topical curation, peer review organization, technical editing, special issue and hybrid open access publication.

The Focus session celebrates the numerous close collaborations and the steady support which the journals receive from their Advisory Board members, authors, reviewers and guest editors, including many members of the DPG and the condensed matter physics community in Germany.

(More information on '60 years of *pss*' is available at http://bit.ly/60_years_pss)

Organizers: Stefan Hildebrandt (Editor-in-Chief, pss), Norbert Esser (TU Berlin, ISAS) and Stephan Reitzenstein (TU Berlin)

Time: Friday 10:00–11:00 Location: H1

HL 21.1 Fri 10:00 H1

Additive manufacturing of permanent magnets based on $(\mathbf{CoCuFeZr})_{17}\mathbf{Sm}_2$ — •Dagmar Goll, Felix Trauter, Philipp Braun, Judith Laukart, Ralf Löffler, Ute Golla-Schindler, and Gerhard Schneider — Aalen University, Materials Research Institute, Beethovenstr. 1, 73430 Aalen, Germany

Lab-scale additive manufacturing of $(CoCuFeZr)_{17}Sm_2$-based powder was performed to realize CoSm printed parts with hard magnetic properties. For manufacturing a special inert gas process chamber for laser powder bed fusion was used. A three-step annealing procedure analogous to sintered magnets was applied. This led to a coercivity of 2.77 T, remanence of 0.78 T and maximum energy density of 109.4 kJ/m^3 for the printed parts. Compared to an isotropic sintered magnet of comparable composition and annealing procedure, the coercivity is of the same order. Due to the texture of the printed parts the remanence is 24 % larger.

HL 21.2 Fri 10:15 H1

Structure solution of a large unit cell approximant derived from $\mathbf{SrTiO_3}$ on Pt(111) — •Stefan Förster[1], Sebastian Schenk[1], Oliver Krahn[1], Holger L. Meyerheim[2], Marc DeBoissieu[3], and Wolf Widdra[1] — [1]Martin-Luther-Universität Halle-Wittenberg, Halle, Germany — [2]Max-Planck-Institut für Mikrostrukturphysik, Halle, Germany — [3]Universite Grenoble Alps, CNRS, SIMaP, Saint-Martin d'Hères, France

The discovery of two-dimensional oxide quasicrystals (OQC) has caused a great amount of interest in aperiodic structure formation from perovskite materials on metal surfaces [1]. In recent years, a plethora of surface science techniques has been applied to OQCs to get an understanding of this peculiar materials system on the fundamental level [2]. In this contribution, we present low-temperature scanning tunneling microscopy (STM) and surface x-ray diffraction (SXRD) investigation of the largest unit cell approximant known so far in 2D systems. Its unit cell covers an area of approximately 44 Å × 44 Å and has p2gg symmetry. STM measurements show 48 atoms in the unit cell forming the vertices of 48 triangles, 18 squares and 6 rhombuses. The structure has been solved utilizing over 300 independent reflections measured by SXRD with an R-factor better than 0.20. From this analysis a profound understanding of the decoration of all tiles with Sr, Ti, and O ions is derived, which solves the structure of the parent OQC.

[1] S. Förster et. al., Nature 502, 215 (2013).
[2] S. Förster et al., Phys. Status Solidi B 257, 1900624 (2020).

HL 21.3 Fri 10:30 H1

Surface reconstructions: challenges and opportunities for the growth of perovskite oxides — Giada Franceschi, Michael Schmid, Ulrike Diebold, and •Michele Riva — Institute of Applied Physics, TU Wien, Austria

Achieving atomically flat and stoichiometric films of complex multi-component oxides is crucial for integrating these materials in emerging technologies. While pulsed laser deposition (PLD) can in principle produce these high-quality films, experiments often show rough surfaces and nonstoichiometric compositions.

To understand the cause, we follow the growth at the atomic scale from its early stages, using STM. We focus on $SrTiO_3(110)$ and $La_{0.8}Sr_{0.2}MnO_3(110)$ films. For both, the non-stoichiometries introduced during growth accumulate at the surface. As a result, their surface structure evolves along phase diagrams of surface structure vs. composition [1,2,3]. This can drastically degrade the surface morphology: pits develop on reconstructed areas with different sticking [4]; ill-defined oxide clusters nucleate when the non-stoichiometry introduced is too large to be accommodated in the surface by changing its structure. On the flip side, one can take advantage of the high sensitivity of surface structures to composition deviations to grow films with thickness of several tens of nanometers retaining atomically flat surfaces, and with stoichiometry control better than 0.1% [1].

[1] Phys. Rev. Mater. **3**, 043802 (2019). [2] J. Mater. Chem. A **8**, 22947 (2020). [3] arXiv:2010.05205 (2020). [4] Phys. Rev. Res. **1**, 033059 (2019).

HL 21.4 Fri 10:45 H1

Investigation of Spin Pumping through α-Sn Interlayer — •Leszek Gladczuk[1], Lukasz Gladczuik[2], Piotr Dluzewski[1], Gerrit van der Laan[3], and Thorsten Hesjedal[2] — [1]Institute of Physics, Polish Academy of Science — [2]Department of Physics, Clarendon Laboratory, University of Oxford — [3]Diamond Light Source, Harwell Science and Innovation Campus

Elemental tin in the α-phase is an intriguing member of the family of topological quantum materials. In thin films, with decreasing thickness, α-Sn transforms from a 3D topological Dirac semimetal (TDS) to a 2D topological insulator (TI). Getting access to and making use of its topological surface states is challenging and requires interfacing to a magnetically ordered material. Recently we have successfully performed an epitaxial growth of α-Sn thin films on Co, forming the core of a spin-valve structure, is reported. Time- and element-selective ferromagnetic resonance experiments were conducted to investigate the presence of spin pumping through the spin-valve structure. A rigorous statistical analysis of the experimental data using a model based on the Landau-Lifshitz-Gilbert-Slonczewski equation was applied. A strong exchange coupling contribution was found, however no unambiguous proof for spin pumping. Nevertheless, the incorporation of α-Sn into a spin valve remains a promising approach given its simplicity as an elemental TI and its room-temperature application potential.